

this region, as already stated. And *Vagnera*, *Arisaema* and *Geranium* seem to be holding their own very well.

Of course it might be said that the absence of any given species from such a small and long-settled region, with only five or six square miles of natural vegetation left, has no particular significance. But many of the species which are scarce here are equally scarce in much larger areas in the same latitude, and probably for the same reasons.

COLLEGE POINT, L. I.

NOTES REGARDING VARIABILITY OF THE ROSE MALLOWS

A. B. STOUT

The swamp rose mallows usually classed as *Hibiscus Moscheutos* grow in abundance along the coastal region of the eastern United States, extending inland in somewhat scattered stations to Missouri. The tall vigorous growth of the plant with the production of numerous, large, gayly colored and conspicuous flowers makes it a noticeable and popularly well-known feature of the vegetation.

In regard to numbers, what may perhaps be considered as a climax development for the species is seen in marshes along the coast of southern New Jersey, especially in the vicinity of Sea Side. Here, a casual survey of the population of mallows will reveal marked variations. Especially is this the case in color of flowers which may range from white to a rather solid intense red with numerous grades of intermediate pinks and with various types of eye coloration combined variously with blade colors. One feature of this variation was recognized in the proposal of a new species by Britton (1903) which was named *Hibiscus oculiroseus*, and by the observation that hybridization between this and the ordinary pink-flowered form of *H. Moscheutos* results in an F₁ hybrid generation that is intermediate and which is of a form frequently seen in nature.

In 1912, at the suggestion of Dr. N. L. Britton, the writer began breeding experiments to determine various points regard-

ing the polymorphism observed in *Hibiscus*. Living plants were obtained of various forms found in nature. Self-fertilized progenies were grown to determine what forms breed true, and cross-pollinations were made between various forms and between various well recognized species in the attempt to reveal clues as to their relationship and to the variability that may arise in nature by natural crossing.

These experiments have been prosecuted somewhat vigorously and as extensively as space in the experimental plots at the New York Botanical Garden would allow. The studies have revealed several facts that admit of a preliminary report at this time which may be of use to various observers in the field. The writer wishes to obtain as full information as possible regarding the regional and geographic variability of the species of *Hibiscus* growing in the eastern United States, especially of the two species *H. Moscheutos* and *H. oculiroseus*. Herbarium specimens are not very satisfactory for the identification of flower color, hence observations on this point should be made on living plants. In correspondence with persons who have very kindly made field observations for the writer, it had been a source of difficulty that there are no standard descriptions of forms. It is hoped that the following descriptions will be of use in this particular. More complete taxonomic descriptions of any that may be found to be species are reserved until later.

HIBISCUS MOSCHEUTOS

The description of the general characteristics of this species may be given as presented in the second edition of the Illustrated Flora of the northern United States and Canada, by Britton and Brown.

“Erect, 4°-7° high, forming numerous cane-like stems from a perennial root. Leaves ovate or ovate-lanceolate, 3'-7' long, cordate or obtuse at the base, acute or acuminate at the apex, the lower or sometimes all lobed at the middle, palmately veined, dentate or crenate, densely white stellate-pubescent beneath, green and glabrous or slightly stellate above; petioles 1'-5' long; flowers 4'-7' broad, pink, clustered on stout pedicels at the summits of the stems; peduncles often adnate to the petioles;

bractlets linear, not ciliate, shorter than the calyx; calyx-lobes ovate; capsule ovoid, 1' long, glabrous or sparingly pubescent, abruptly short-pointed or blunt; seeds glabrous."

At the present time the cultures of *Hibiscus Moscheutos* grown at the New York Botanical Garden include several races which appear to breed true and which are sufficiently distinct to be readily identified. Unless specifically mentioned the characters agree closely with those of the species as described above. The color determinations were made with the aid of Ridgway's Color Standards and Nomenclature.

Race 1.—No red in foliage. Corolla-blades amaranth pink, except for an almost pure white area of a radius of about three eighths of an inch at base surrounding stamen column. Stamens of nearly equal length, those at base of column only slightly shorter. Pollen yellow. Stigmatic lobes broad. Pods blunt. The general character of this race is shown in the colored plate presented in the *National Geographic Magazine* 39: 597 and which, as it now seems, may be taken as a biological type of the species.

Race 2.—Like race 1, but with darker shade of coloration in petals.

Race 3.—Like race 1, but decidedly paler, the color being noticeable but of a very pale diffuse pink.

Race 4.—Like race 1, but with the white of the center extending out along the main veins nearly to the tips of the corolla-lobes in radiating streaks.

Race 5.—An *alba* form, nearly pure white; faintest suggestion of pink coloration in buds and occasionally in flowers. Pollen almost white, noticeably less yellow than in races 1-4.

Race 6.—An eyed form: Tyrian rose at base of petals for radius of about half an inch, the color extending out in veins into the blades which are chiefly a dead white. Pollen white. Considerable red pigmentation in stems and in the petioles, and veins of the leaves.

Race 7.—Red coloration decided in stems and in the petioles and veins of the leaves. Corolla fully colored, amaranth pink at tips of lobes, the color gradually becoming more intense until

at the base of the stamen column it is almost Tyrian rose; color slightly more intense in veins of lobes; areas of color extending up stamen column and into stamens. Pollen yellow. Stigmatic lobes smaller than in forms 1-6. Pods decidedly beaked.

This form is undoubtedly sufficiently different from *Hibiscus Moscheutos* to be considered as a distinct species. In respect to flower color and shape of capsule especially, it is decidedly different from ordinary forms of the species. Thus far I have seen but one plant of this form growing wild. Two generations of self-fertilized offspring have bred true.

Various crosses have been made between several of the above forms. In general the F_1 generation in each case has been rather intermediate. An F_2 generation has been grown of the cross between Races 5 and 7; the characteristics of Race 7 predominated in the large majority of this generation.

What appears to be a dwarf race has been observed growing at Rockaway, Long Island. Mr. Norman Taylor reported the occurrence of dwarf plants at this locality. When the writer visited the locality in the autumn of 1916, the plants were not in bloom. The dwarf habit of growth was very decided. No plant was found that was over 26 inches tall, and these plants were evidently several years old. Twenty-five plants were transplanted to the experimental plots at the New York Botanical Garden for further observation.

HIBISCUS OCULIROSEUS

Britton (1903) proposed this name giving the rank of a species to the crimson-eyed *Hibiscus* then in cultivation and rather generally considered a variety of *H. Moscheutos*. The description by Britton and Brown (1913) is as follows:

"Similar to the preceding species (*H. Moscheutos*) in stems, foliage and pubescence, and about as high, the flowers about as large. Calyx-segments triangular-lanceolate, acute, nearly twice as long as wide; corolla white with a dark crimson center; capsule ovoid-conic, long-pointed."

The pedigreed cultures of this species grown at the New York Botanical Garden have bred quite true to the ovoid character

of the pod. The color of the corolla-blades is a sea-foam yellow rather than white, and the eye is of Tyrian rose, which is a rather intense shade of red. There are further distinguishing characters in the small stigmatic lobes, which here are scarcely expanded ends of the divisions, and in the light yellow or almost white color of the pollen. There is also a considerable difference in the length of the various stamens, those at the base of the stamen-ring having shorter filaments, and there is considerable red in stems and foliage quite as in Races 6 and 7 of *Hibiscus Moscheutos* described above.

Some lines of descent have bred remarkably true to the above mentioned characters, but others have shown considerable variation in the color of the flowers, the tendency seeming to be toward decreased intensity of the eye area and to the development of pale diffuse colors in the blade. There has also been a pronounced tendency toward dwarfness, as has been discussed by the writer (Stout, 1915).

HYBRIDS BETWEEN *H. oculiroseus* AND *H. Moscheutos*.

Britton and Brown (1913) recognize a hybrid between these two species and note that it is intermediate in flower character. The writer has produced these hybrids in pedigreed cultures from seed obtained by controlled pollinations. The F₁ hybrids between the typical *oculiroseus* and *Moscheutos* (Races 1, 2 and 3) have flowers with an eye of less intense color than has *H. oculiroseus* combined with a pale pink blade. The stigmas, stamens and pod characters are rather intermediate. It may be noted that the beautifully colored illustration given in *Flore des Serres*, vol. 12, Plates 1233-1234, 1857, and there identified as *Hibiscus Moscheutos* is an exact representation of the F₁ hybrids of this cross. The F₂ generation breaks up into almost every conceivable grade of variation in regard to eye and blade colorations and to characteristics of stigma, stamens and pods.

F₁ plants of the cross between *H. oculiroseus* and *H. Moscheutos*, Race 5, are at first sight quite readily taken for *H. oculiroseus*, but a more careful examination shows that the eye is paler and the blades are dead white instead of pale sea-foam yellow. Plants of the F₂ generation of this cross have not yet bloomed.

The results obtained in pedigreed cultures indicate that various races exist within the species of *H. Moscheutos* and that hybridization among these and *H. oculiroseus* will result in increased variability.

There is considerable literature (no attempt will be made here to summarize the literature) which indicates that there is more or less marked geographic limitations or even isolation of various races and that other races than those here mentioned may exist. Thus the variability may be quite different at various stations throughout the range.

Very little is known regarding the range of *Hibiscus oculiroseus*. In some localities plants resembling this species seem to predominate. Rev. J. P. Otis (personal correspondence) finds this to be the case near Marshallton, Delaware. However, flowers of nine plants which he sent to the writer showed that none of these conformed to the type of the species: the eye was much paler and the corolla-blades were either of pinkish tinge or were white instead of sea-foam yellow. Although there are many plants somewhat resembling *H. oculiroseus* to be found along the coast southward from New York City, none that the writer has yet seen have agreed with the type of the species grown at the New York Botanical Garden.

With the exception of Race 7, all the races of *H. Moscheutos* thus far tested hybridize readily with *H. militaris* giving highly fertile F₁ progeny. The latter species is decidedly distinct from either *H. Moscheutos* or *H. oculiroseus* and has a range that is more exclusively inland. It would seem, however, that in many localities both *H. Moscheutos* and *H. militaris* are to be found and that in such regions natural hybridization may occur producing much variability. Dr. O. E. Jennings has informed the writer, in a letter, that the form of *H. Moscheutos* which grows at Presque Isle, Lake Erie, has prevailingly three-lobed leaves. Evidently the shape of the leaves is somewhat like that seen in *H. militaris*, a condition which has not been seen in any of the races of *Moscheutos* that the writer has seen along the coast.

It will greatly facilitate the writer's efforts to make a field survey of the rose mallows if persons who have opportunity will

report observations on the characteristics and relative abundance of the particular form or forms that they find at various stations. The writer will be pleased to receive fresh leaves and flowers for comparison with the species and races now growing at the New York Botanical Garden. If branches with flower buds are cut a day before the flowers are to open, slightly dampened with water, and immediately wrapped in paper and enclosed in a pasteboard box, they will keep in rather good condition for several days. Herbarium specimens may be made and while not revealing much regarding flower colors these are excellent for a study of leaf and pod characters.

It is also planned to extend the cultures at the New York Botanical Garden to include as many as possible of the different races or species found in nature. Plants can be transplanted at, or soon after, the close of the flowering period; the stems can be cut away, most of the dirt shaken from the roots, and the plant wrapped in paper to prevent drying out and shipped as soon as is convenient. A large majority of plants thus treated have lived when transplanted to the experimental plots. If possible, however, three plants of a particular form should be sent to insure against possible death of some.

The writer will fully appreciate any cooperation which will facilitate the study of these interesting and variable species.

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AN EXCURSION TO DELAWARE WATER GAP

WILLIAM A. MURRILL

The Decoration Day Excursion of the Torrey Botanical Club, led by Mr. Percy Wilson, was made to Delaware Water Gap, Pennsylvania, May 29-31. Eleven persons participated in this